Flood-MAR

Using Floodwater for
Managed Aquifer Recharge

Public Workshop
August 30, 2018

CALIFORNIA DEPARTMENT OF
water resources

1

Workshop Purpose

- Provide information and context for DWR's new Flood-MAR Program
- Obtain your feedback
- Identify needs and concerns for implementing Flood-MAR projects

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Agenda

- Welcome and Introductions
- Overview of Flood-MAR Program
- State Board of Food and Agriculture - Recommendations
- Merced River Reconnaissance Study
- Research and Data Development
- How to Stay Involved
- Next Steps

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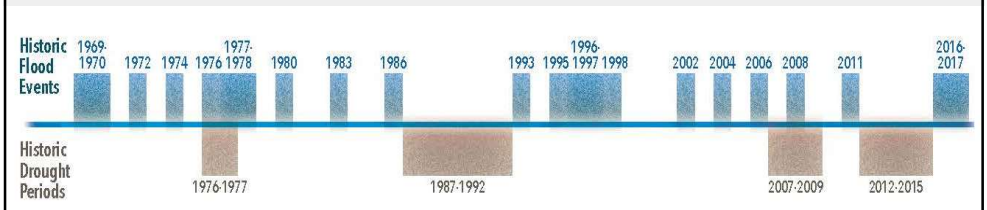
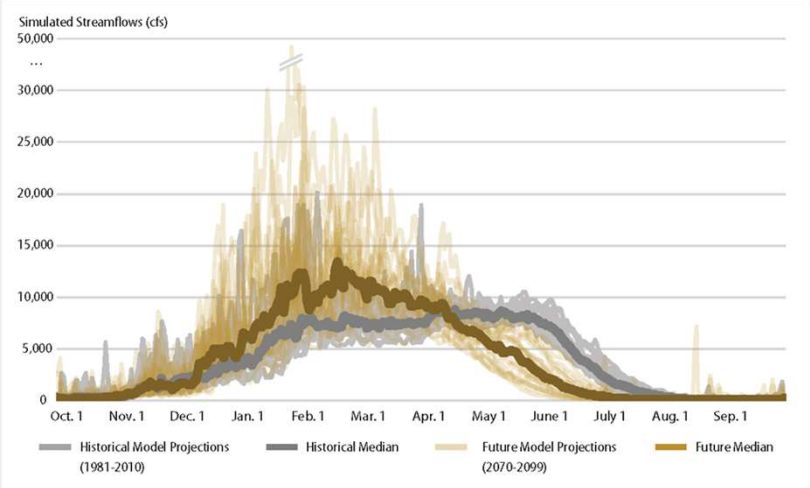
Flood-MAR Public Workshop

OVERVIEW OF FLOOD-MAR STRATEGY AND DWR PROGRAM ACTIVITIES

California's Water Management
A Tale of Two Extremes



Effects of Climate Change Necessitate Wholesale System Changes



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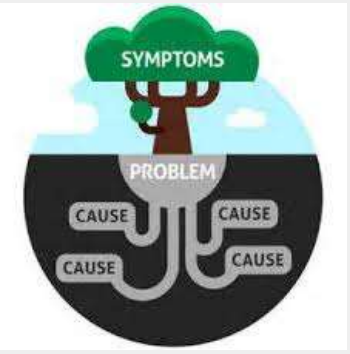
Systemic Challenges - Root Cause of Others

Overcoming them Increases Return on Investment

- Fragmented and uncoordinated decisions, initiatives & actions
- Inconsistent, inflexible, & conflicting regulations
- Insufficient capacity for data-driven decision-making
- Insufficient & unstable funding



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Sustainable and Integrated Water Resources Management

- Governor's Water Action Plan
- Sustainable Groundwater Management Water Act
- 2017 Central Valley Flood Protection Plan Update
- California Water Plan Update 2018
- Call for multiple benefit projects that include ecosystem enhancements to move California's water resources toward sustainability

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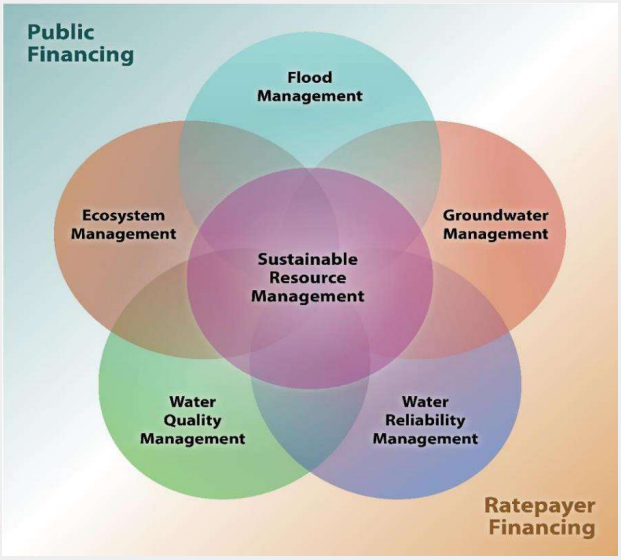
Sustainability Requires Alignment



Multi-Sector Collaboration

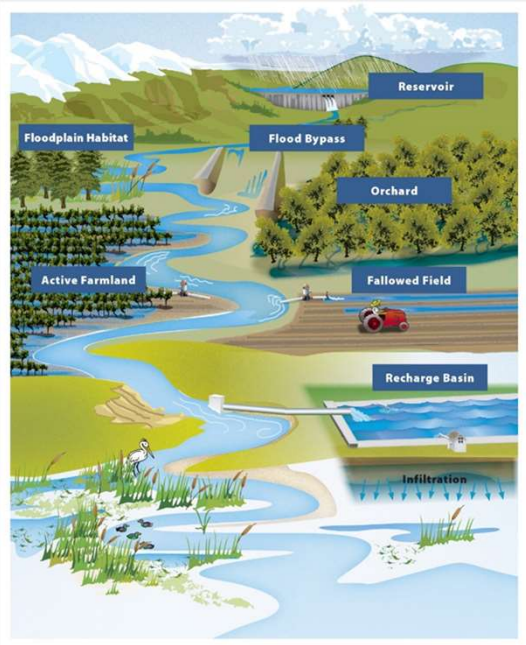
Multi-Discipline Planning

Multi-Benefit Projects

Multi-Fund Investments

What is Flood-MAR?

Using high flows from, or in anticipation of, rainfall or snowmelt, for managed aquifer recharge on agricultural lands and working landscapes



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Flood-MAR is…

- … an integrated & voluntary management strategy to improve water resources sustainability & climate resiliency
- … multi-sector (flood, surface & groundwater, ecosystem, quality)
- … scalable (farm, GSA, basin, region, watershed)
- … multi-faceted (reoperation, conveyance, storage, recharge, banking, transfers, cultivation, restoration, etc)
- … an untapped part of California's water portfolio

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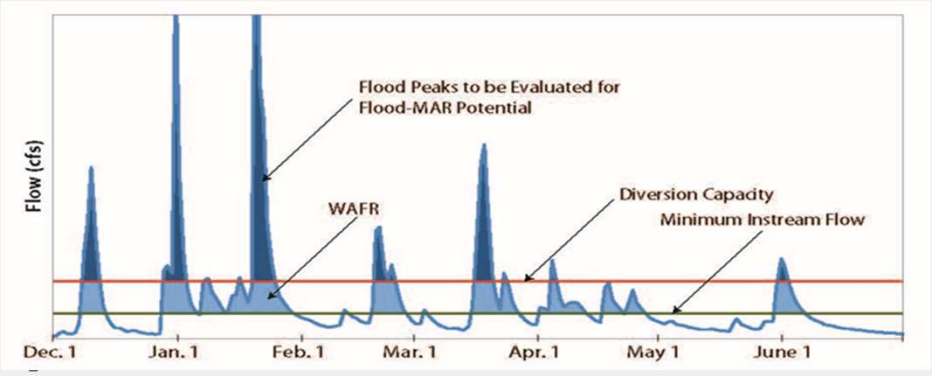
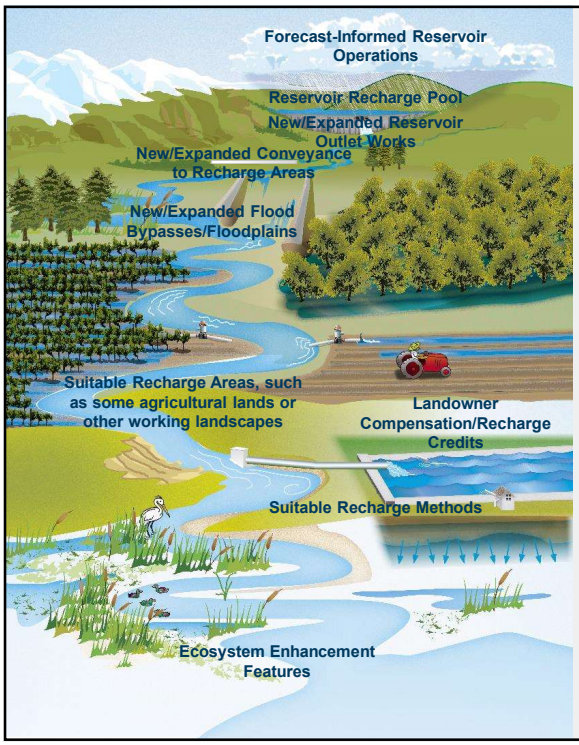
State Recommends Flood-MAR

- 2017 CV Flood Protection Plan Update (Aug. 2017)
- System Reoperation Study Phase 3 Report (Aug. 2017)
- State Board of Food & Agriculture letter (May 2018)
- CA Water Plan Update 2018 Public Draft (July 2018)





Potential Project Components for Flood-MAR Project Formulation

** Graphic does not represent an exhaustive list/representation of potential components of Flood-MAR projects

Public Benefits of Flood-MAR

- Flood risk reduction★
- Drought preparedness★
- Aquifer replenishment ← Green Infrastructure
- Ecosystem enhancement ★
- Groundwater remediation/water quality ★
- Working landscape preservation and stewardship
- Climate change adaptation
- Recreation and aesthetics★

★ Public benefits defined in Proposition 1

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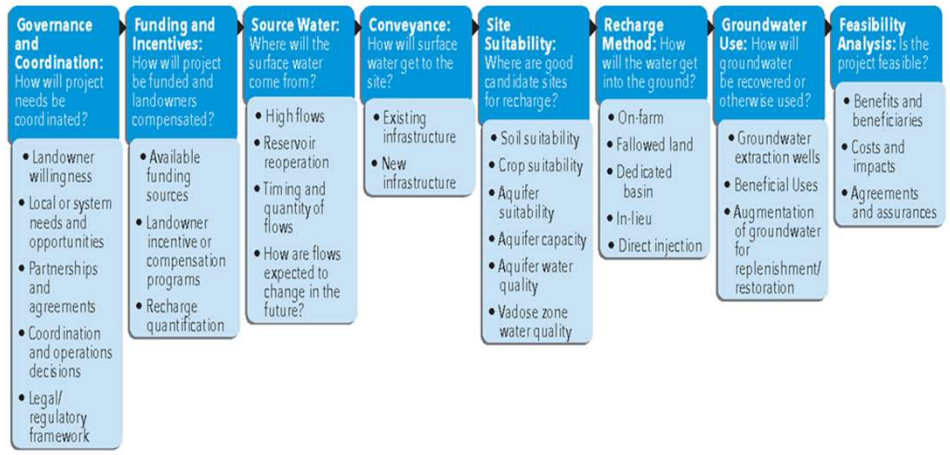
Flood-MAR Implementation Factors



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Potential Barriers to Flood-MAR Implementation

- **Cooperation and Governance** – trust, sector coordination, operations agreements
- **Legal** – water rights, regulations, permitting
- **Policy** – public benefit, beneficial use, landowner compensation/incentives
- **Implementation** – land use, recharge/recovery suitability, conveyance, reservoir operations, economics, funding

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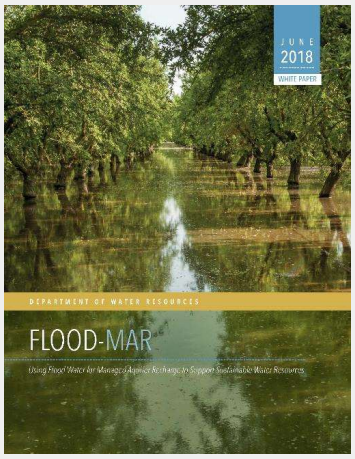
Current Plans and Activities

- Fact Sheet
- White Paper
- Draft Research & Data Development Framework
- Convening Research Advisory Committee
- Merced River Basin Conceptual Study
- Tuolumne River Climate Vulnerability Study



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Current Program Funding

- DWR has early funding for:
  - Conducting reconnaissance studies
  - Providing technical assistance
  - Convening potential partners and stakeholders
  - Framing research and data needs
- DWR is soliciting information on local and regional project needs

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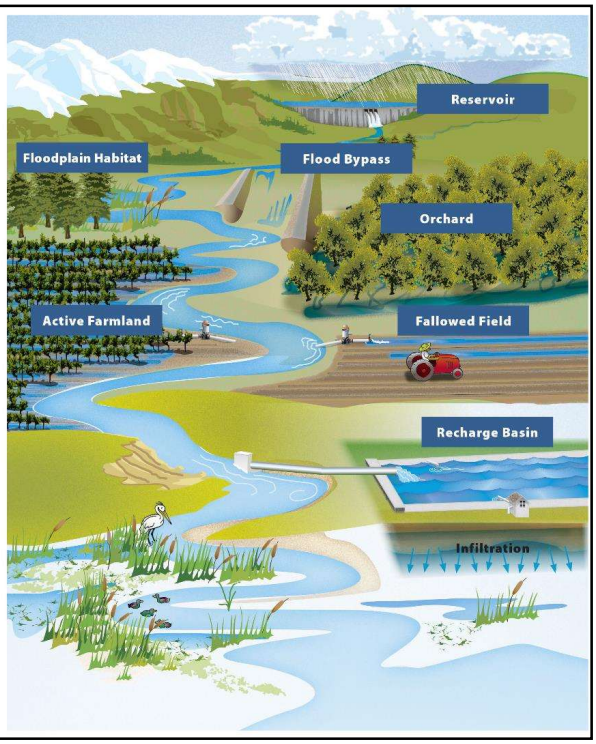
Questions?



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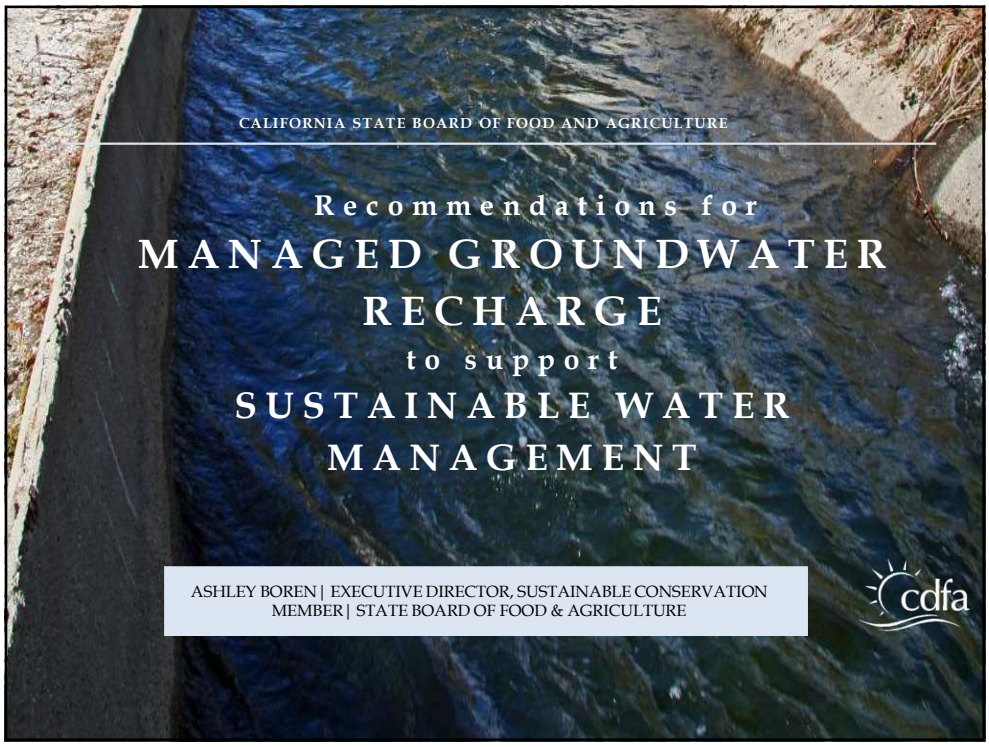
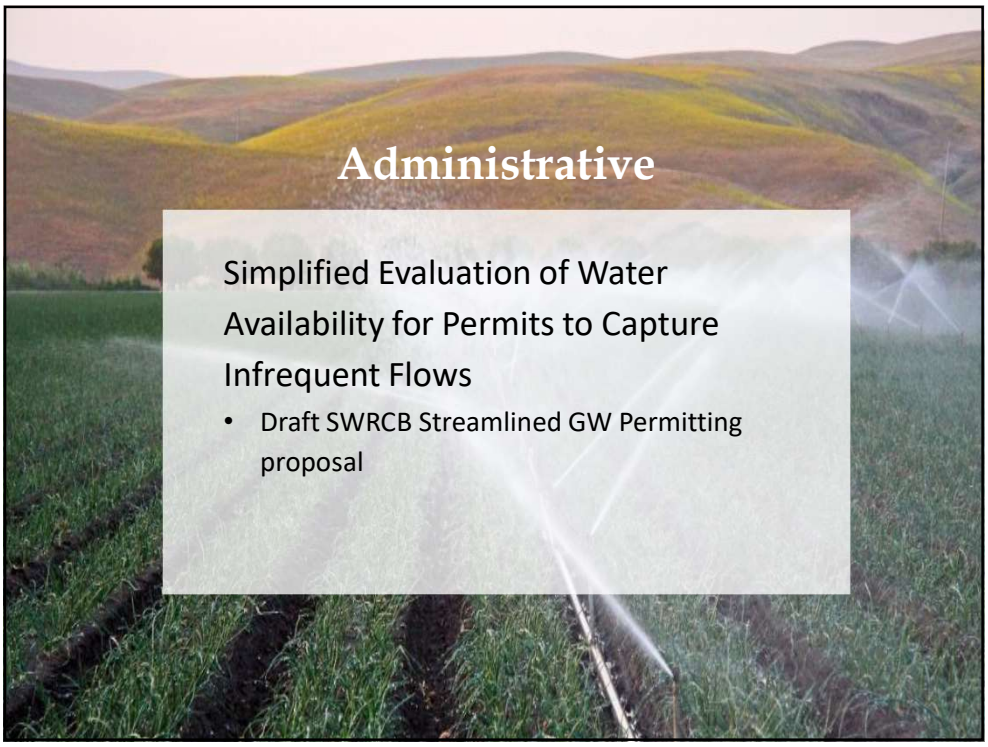
STATE BOARD OF FLOOD AND AGRICULTURE MAR RECOMMENDATIONS

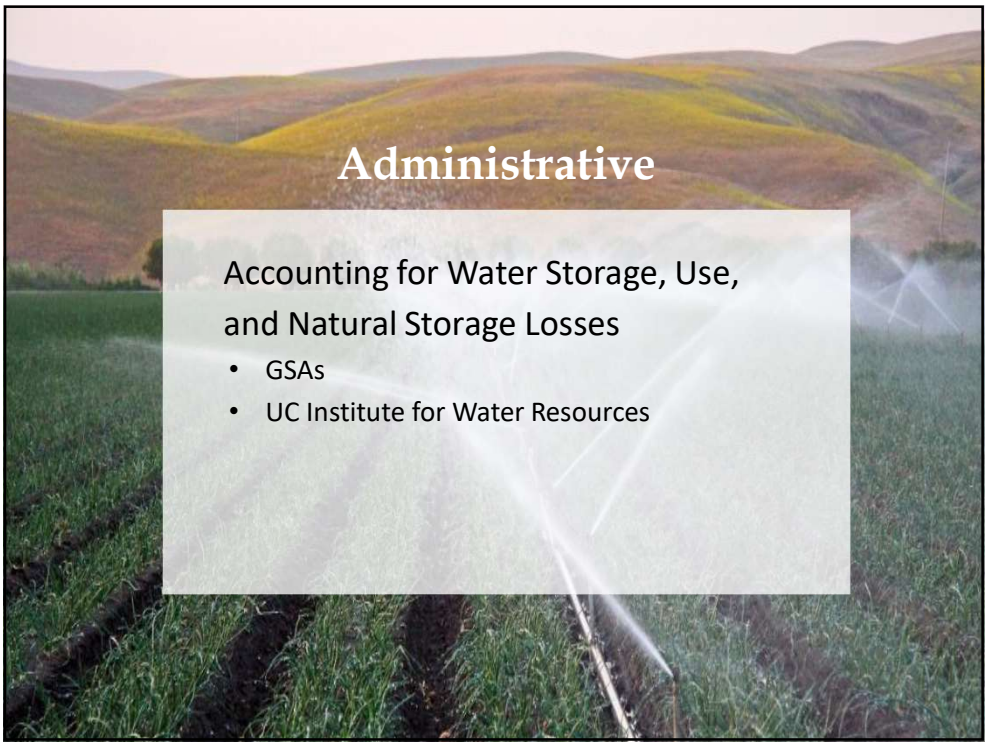

CALIFORNIA STATE BOARD OF FOOD AND AGRICULTURE
Recommendations for
MANAGED GROUNDWATER RECHARGE
to support
SUSTAINABLE WATER MANAGEMENT
ASHLEY BOREN | EXECUTIVE DIRECTOR, SUSTAINABLE CONSERVATION
MEMBER | STATE BOARD OF FOOD & AGRICULTURE
cdfa

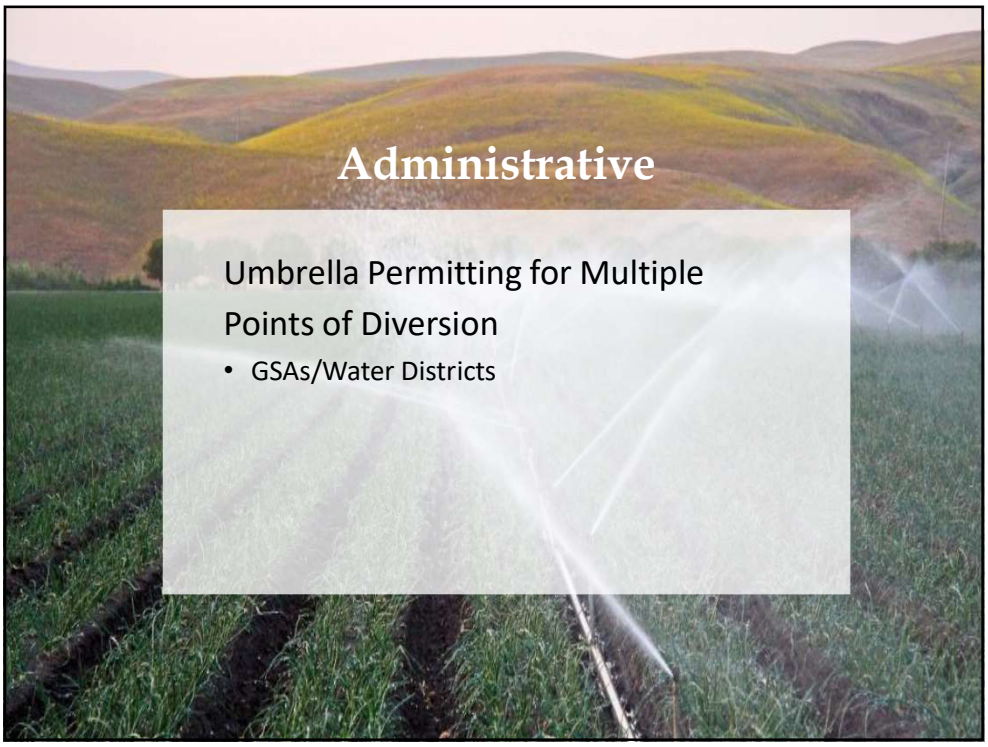

STATE BOARD OF FOOD & AGRICULTURE REQUEST
June, 2017
Managed Aquifer Recharge Workshop
November 7, 2017
Recommendations to the Governor
May 2018

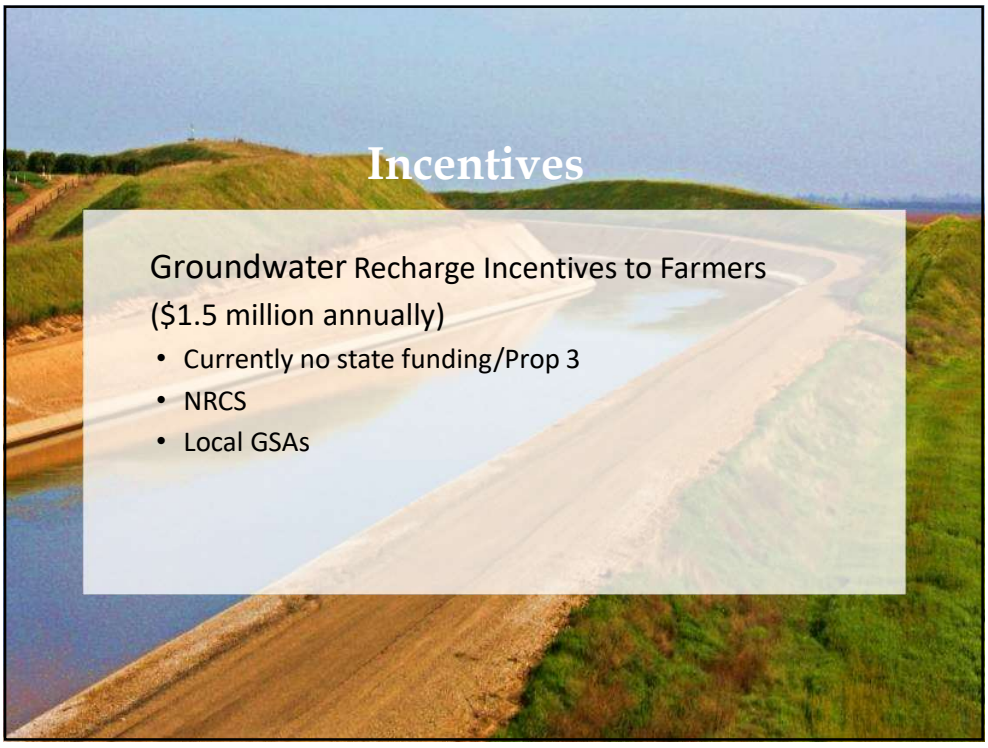

Administrative
State Government should ensure that Definitions, Statute, and Grant Programs do not inadvertently limit the ability of GWR Projects to receive funding
• Prop 68
• Nov Bond Measure
• Remaining Prop 50 funding
• Safe Drinking Water loan funds

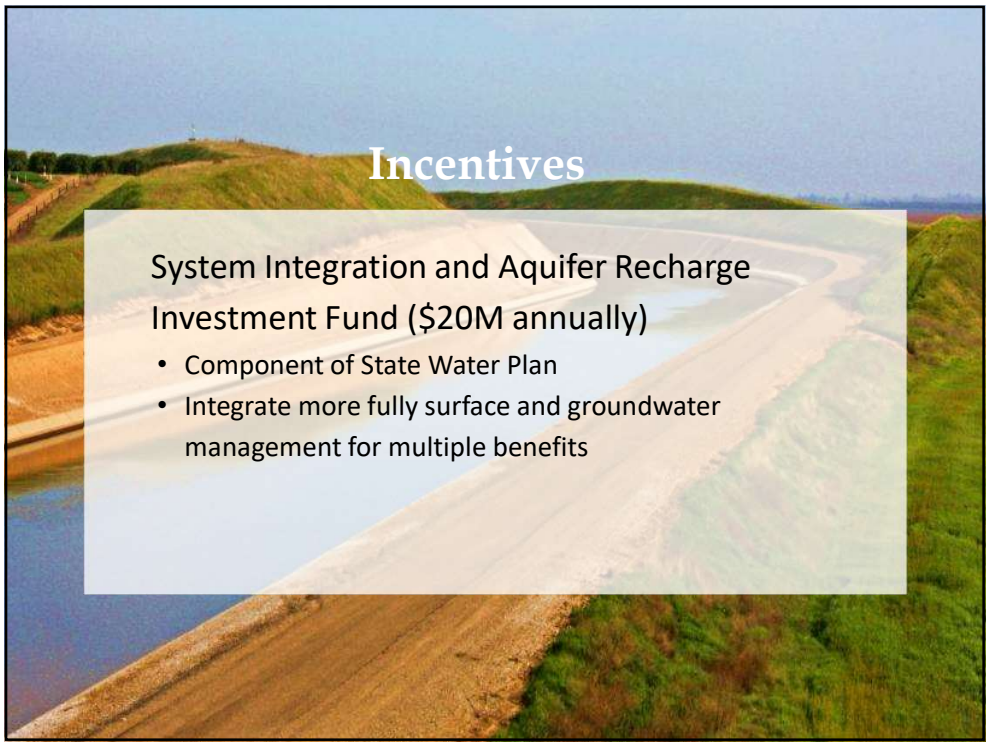

Administrative
Establish a Flood-MAR Program in State Government ($5 million annually)
• Funding from Prop 68 has been applied to DWR Flood MAR program for 1 year with potential for future years

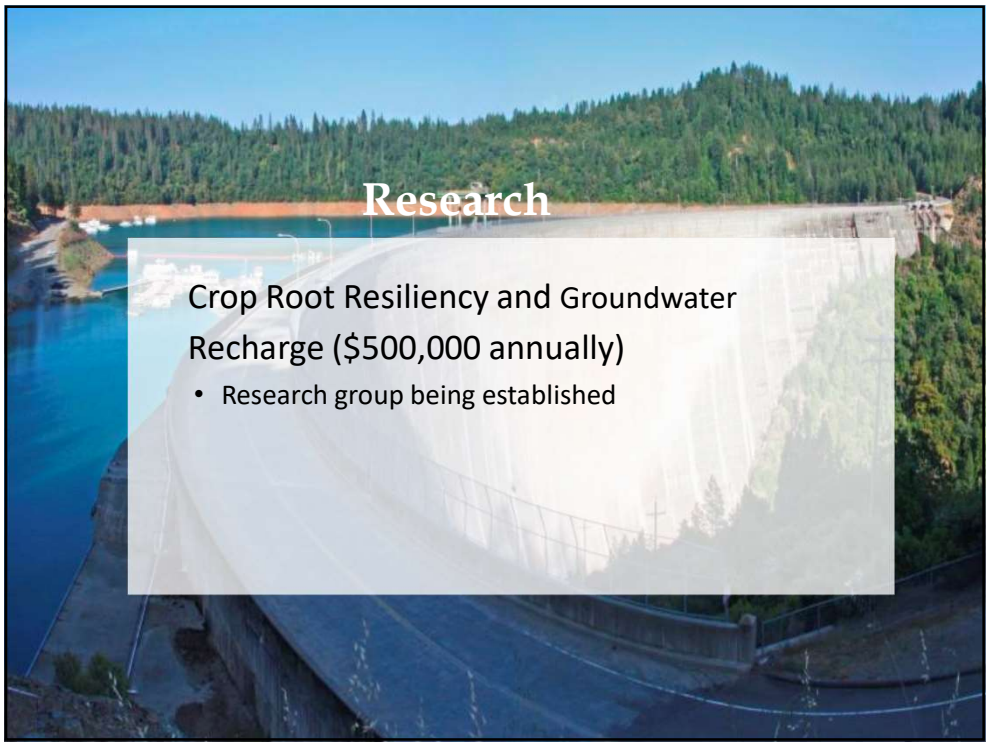

Administrative
Simplified Evaluation of Water Availability for Permits to Capture Infrequent Flows
• Draft SWRCB Streamlined GW Permitting proposal

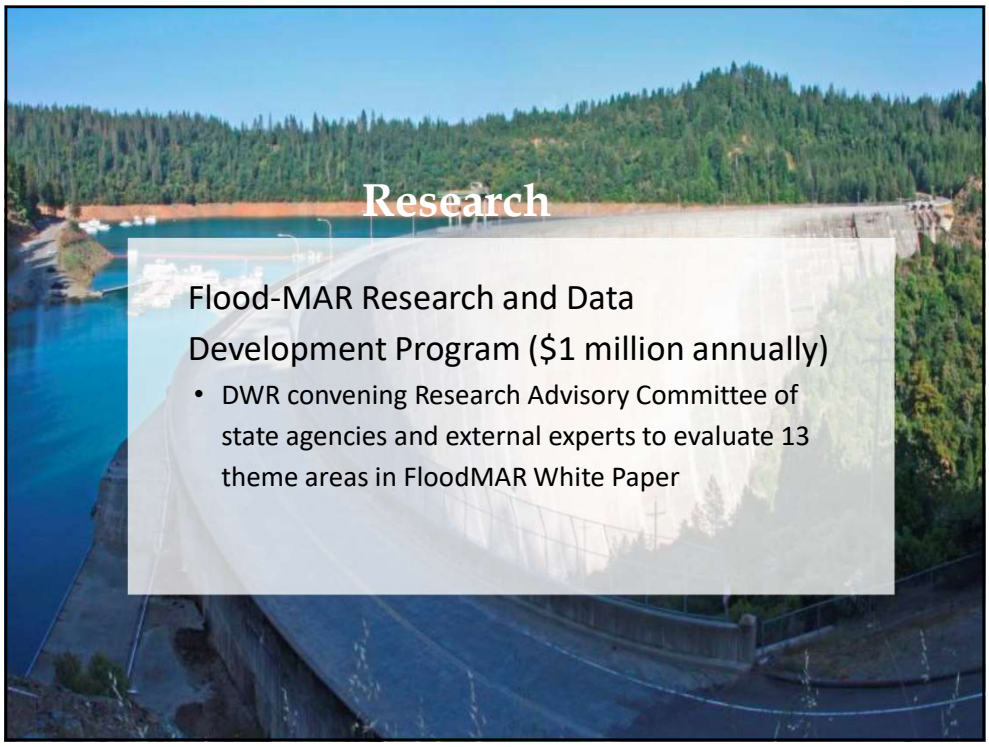

Administrative
Accounting for Water Storage, Use, and Natural Storage Losses
• GSAs
• UC Institute for Water Resources

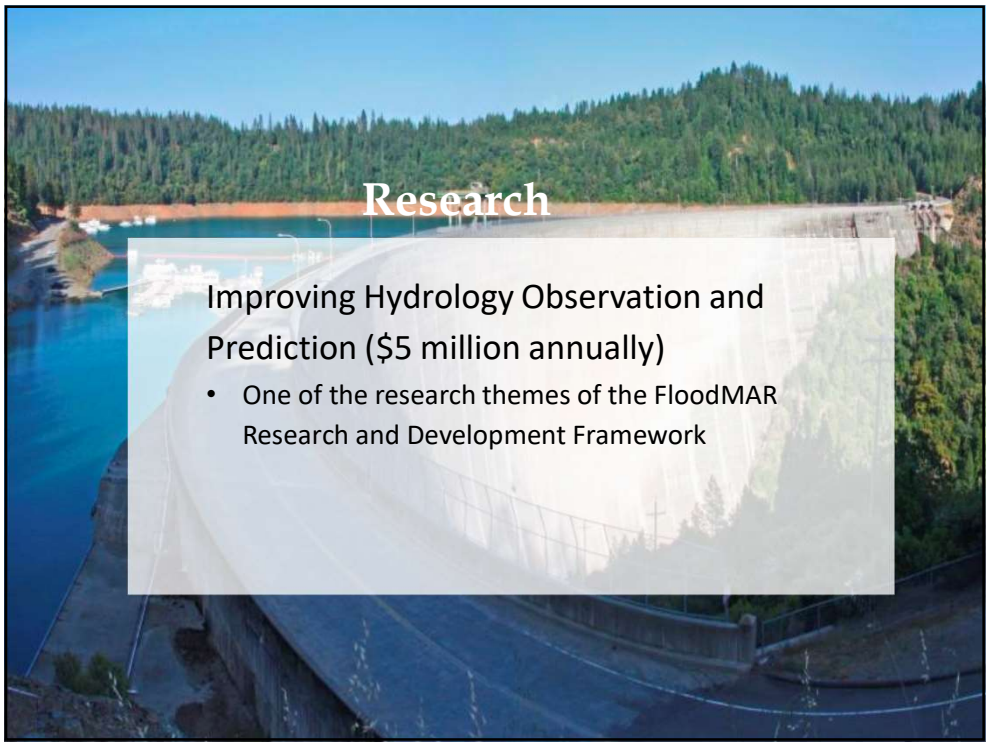

Administrative
Umbrella Permitting for Multiple Points of Diversion
• GSAs/Water Districts

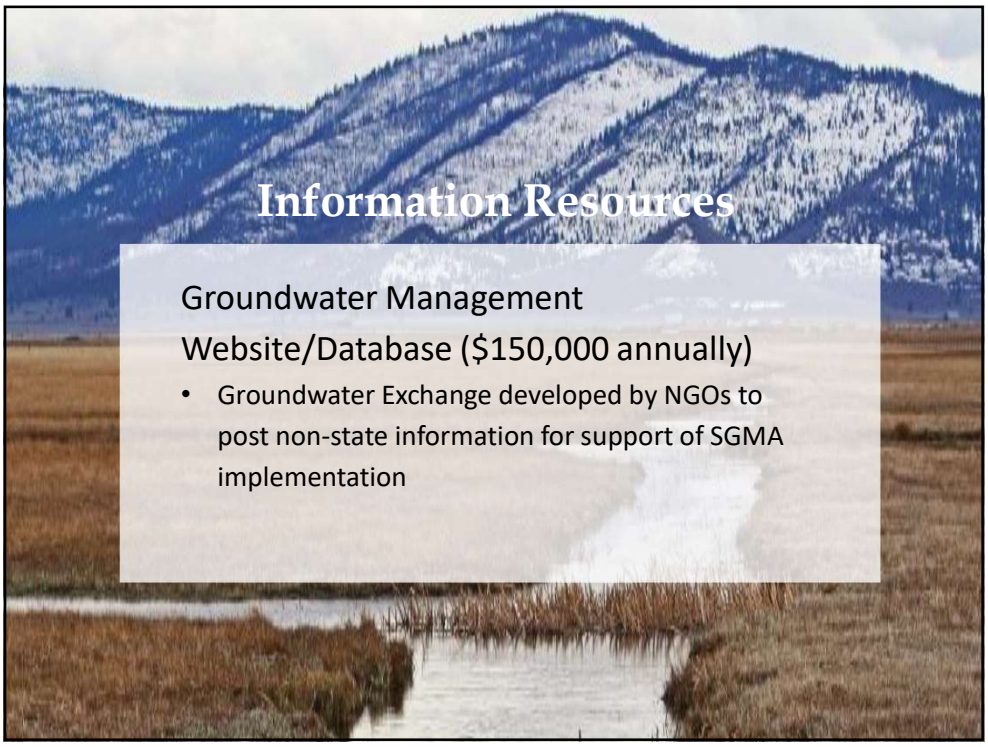

Incentives
Groundwater Recharge Incentives to Farmers ($1.5 million annually)
• Currently no state funding/Prop 3
• NRCS
• Local GSAs

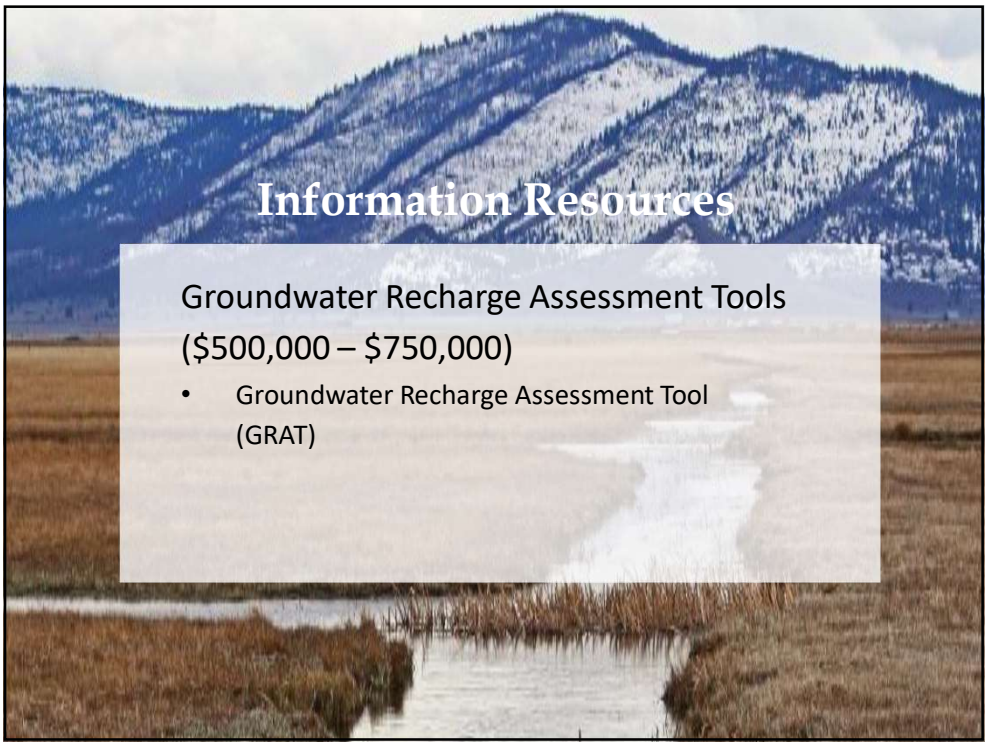

Incentives
System Integration and Aquifer Recharge Investment Fund ($20M annually)
• Component of State Water Plan
• Integrate more fully surface and groundwater management for multiple benefits


Research
Crop Root Resiliency and Groundwater Recharge ($500,000 annually)
• Research group being established

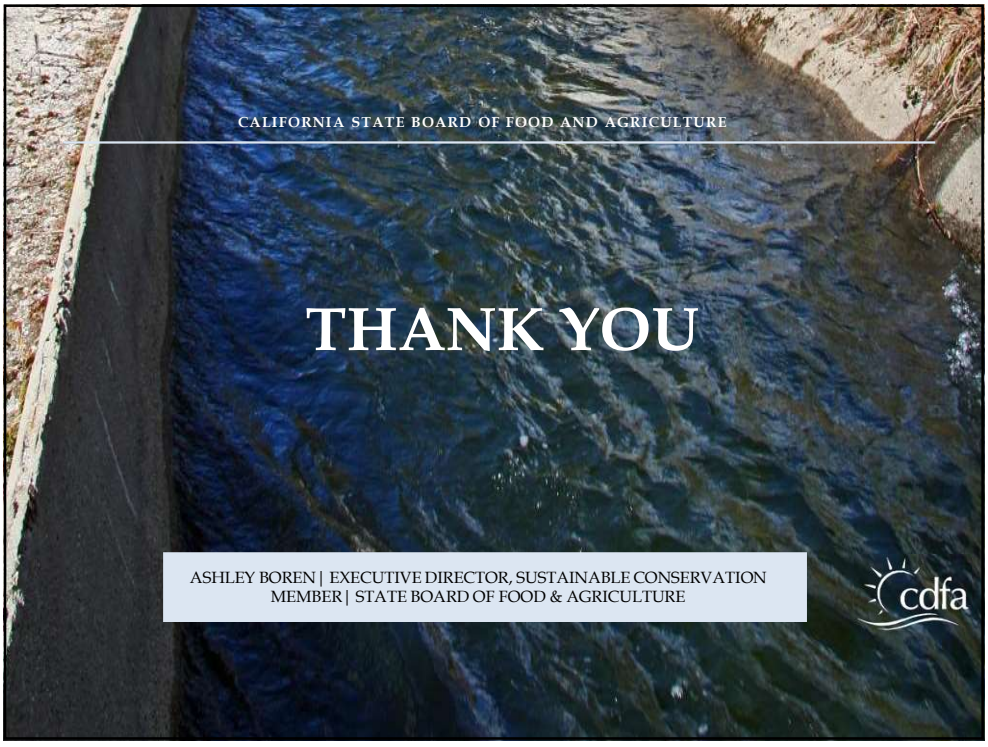

Research
Flood-MAR Research and Data Development Program ($1 million annually)
• DWR convening Research Advisory Committee of state agencies and external experts to evaluate 13 theme areas in FloodMAR White Paper


Research
Improving Hydrology Observation and Prediction ($5 million annually)
• One of the research themes of the FloodMAR Research and Development Framework


Information Resources
Groundwater Management
Website/Database ($150,000 annually)
• Groundwater Exchange developed by NGOs to post non-state information for support of SGMA implementation


Information Resources
Groundwater Recharge Assessment Tools
($500,000 – $750,000)
• Groundwater Recharge Assessment Tool (GRAT)


Information Resources
Ongoing State Engagement with Growers & GSAs ($150,000 annually)
• CDFA and DWR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THANK YOU
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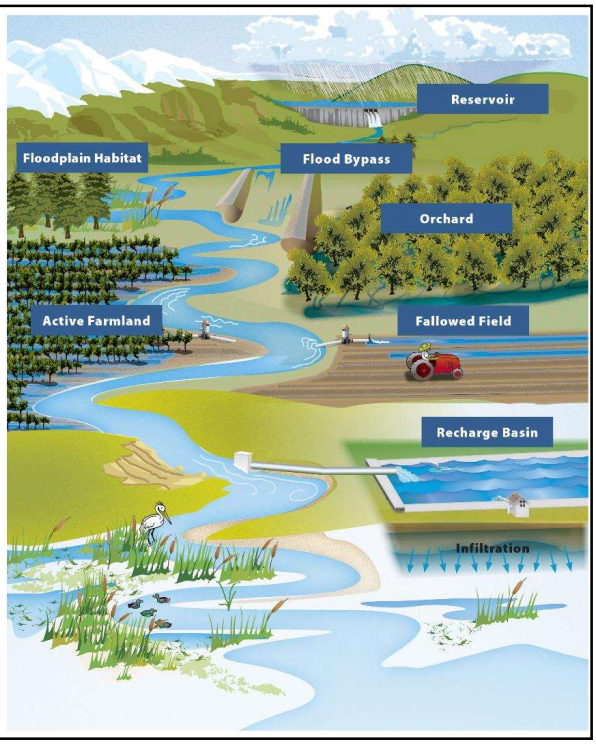
Questions?



Flood-MAR Public Workshop

MERCED RIVER RECONNAISSANCE STUDY

Discussion Preview

- What do you need help with in planning and implementing Flood-MAR projects?
- Where are good locations to evaluate Flood-MAR projects for multiple benefits?

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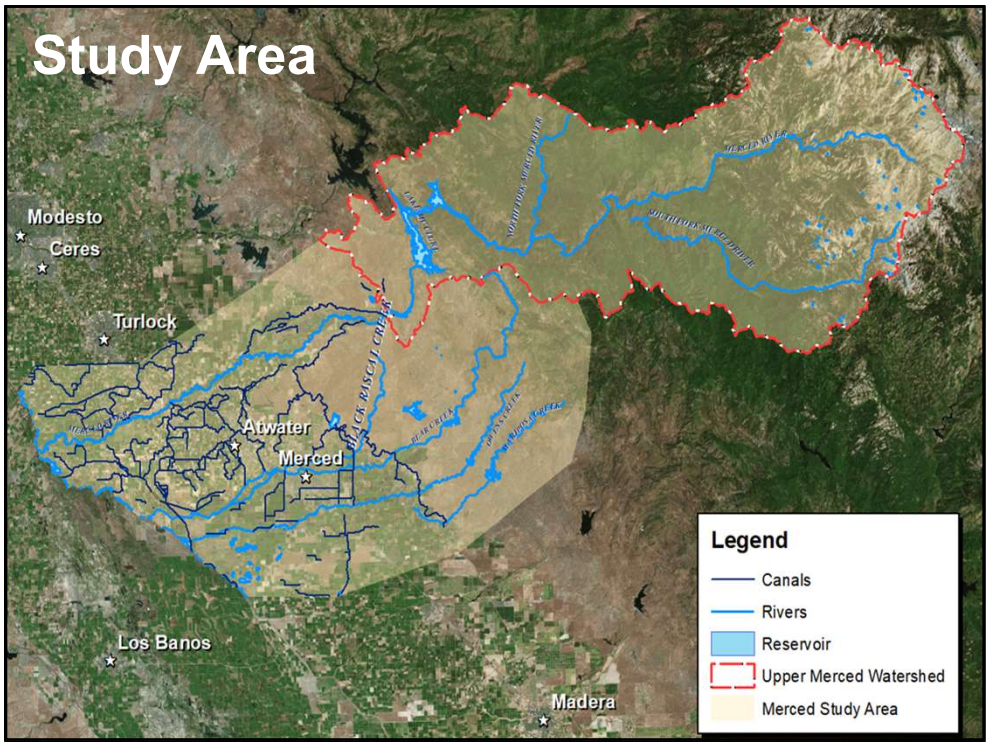
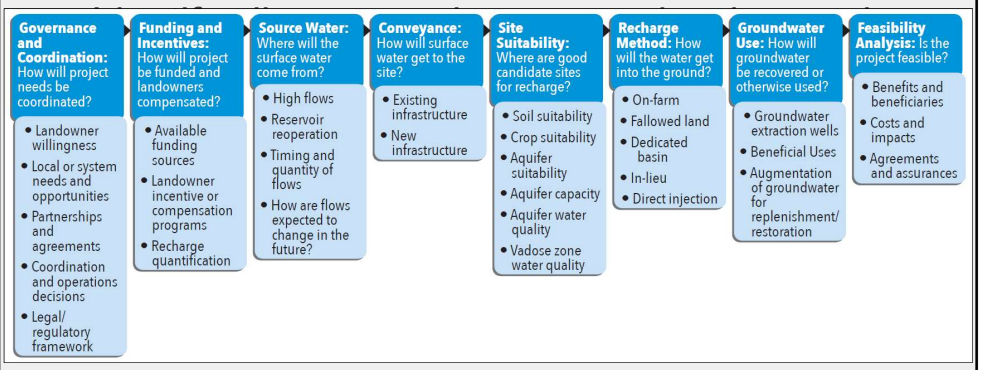


Study Purposes & Goals

- Proof of concept study: Investigate the Flood-MAR concepts & implementation factors



Development Framework

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Study Purposes & Goals

- Proof of concept study: Investigate the Flood-MAR concepts & implementation factors
- Identify, discuss, and overcome barriers and constraints
  - Institutional
  - Cultural
  - Policy
  - Financial
  - Technical
  - Legal
- Test theories: Research themes presented in the Flood-MAR Research & Data Development Framework

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Study Purposes & Goals

- Integrate surface and groundwater analyses
- Assess multi-benefits and economics
- Document the process of planning, modeling, and analyzing a Flood-MAR project of this scale
- Template for future studies

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Study Approach

- Outreach and coordination with local water interests
- Analyze a potential range of assumptions to understand the benefits
  - How much surface water is available?
  - How will surface water get to recharge areas?
  - What are good candidate sites for recharge?
- Analysis of results: What do they tell us about the implementation factors and barriers?

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Analytical Procedure

- Analyze and screen scalable scenarios within three progressive levels of Flood-MAR implementation
  - Level 1 – Existing Operations / Existing Infrastructure
  - Level 2 – Revised Operations / Existing Infrastructure
  - Level 3 – Revised Operations / New and Expanded Infrastructure
- Analyze climate change using a vulnerability assessment methodology

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Models

- Screening Analysis – Excel Model
- Hydrologic Routing - SAC-SMA-DA
- Reservoir Operations – HEC-ResSim
- Hydraulic Routing – HEC-RAS
- Flood Damage – HEC-FDA
- Groundwater Modeling – C2VSIM
- Systemwide Modeling – HEC-WAT

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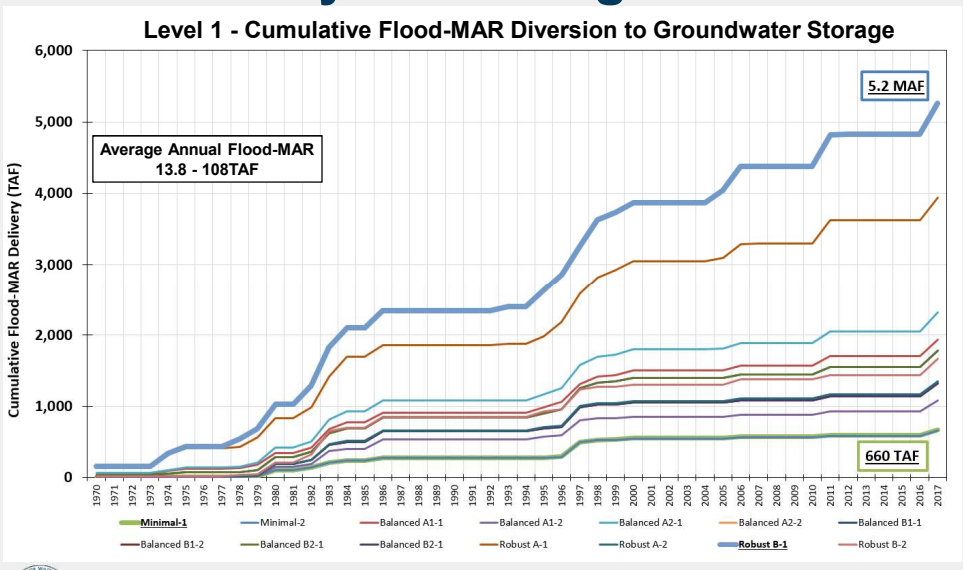
Preliminary Screening Results



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Results subject to change

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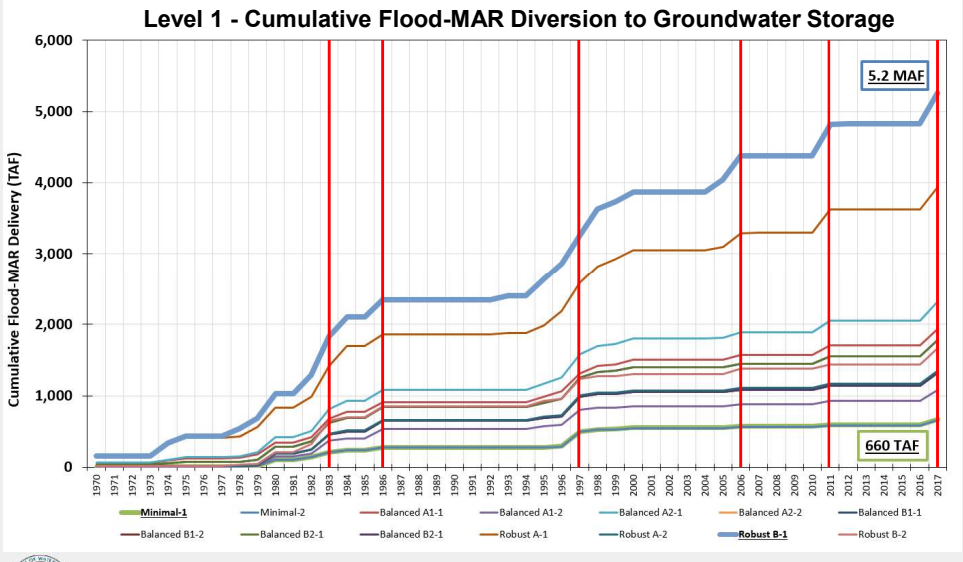

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Results subject to change

Climate Change Vulnerability Analysis

- Past studies have shown increasing future flood risk in the Central Valley due to climate change.
- Quantify deep uncertainties in flood and drought prediction with climate change
- Paleoclimatic reconstructed hydrology
  - 500 years of continuous hydrology
  - 0° to 4° Celsius increase in temperature
  - -30% to +30% change in precipitation

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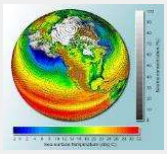
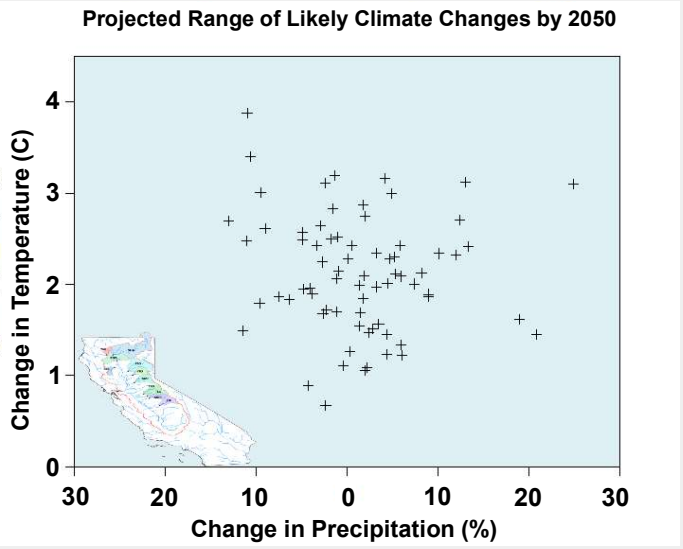
Global Climate Model Projections





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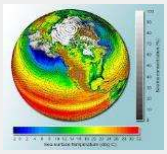

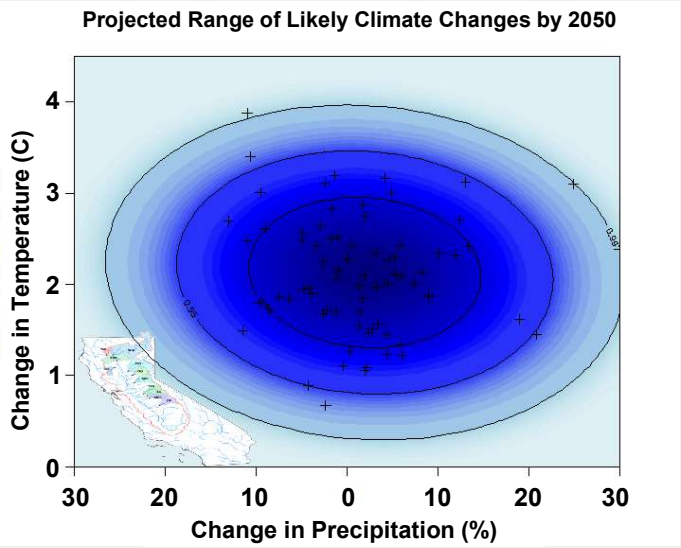

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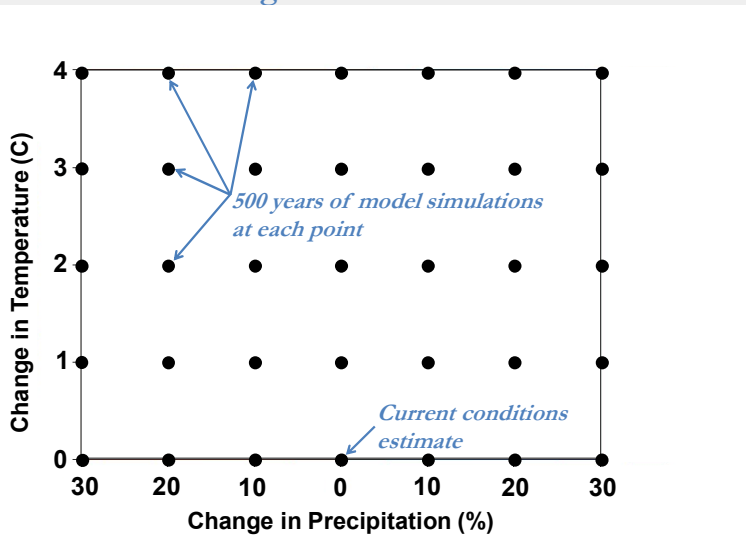
System Response Surface

Annual Average Inflow Volume = 1.0 MAF



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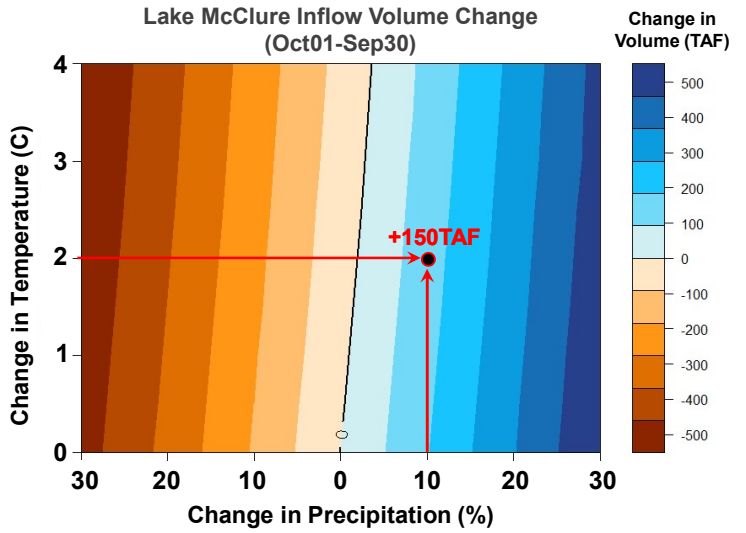

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System Response Surface

Lake McClure Inflow Volume

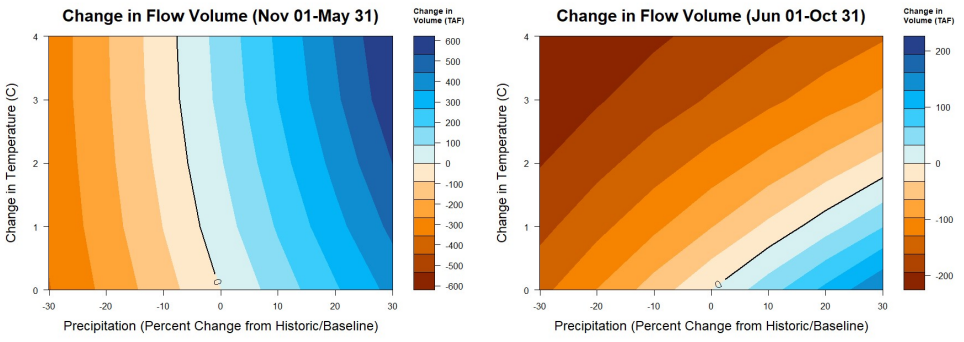
Annual Average Inflow Volume = 1.0 MAF

Flood Control

(Average Flow Volume: 728 TAF)

Water Supply

(Average Flow Volume: 272 TAF)



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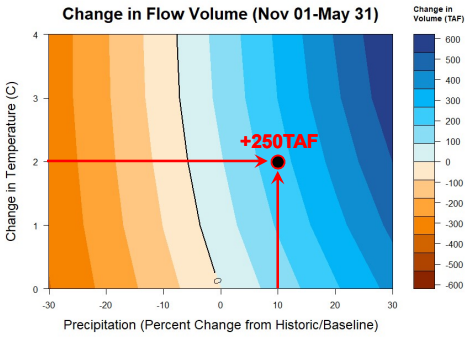

Water Supply

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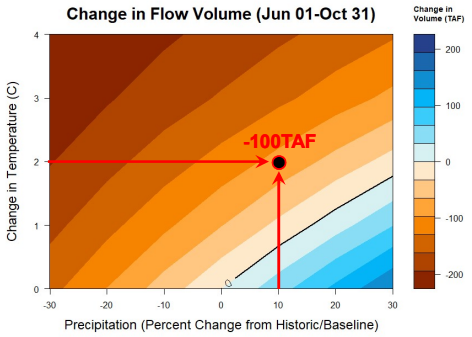

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System Response Surface

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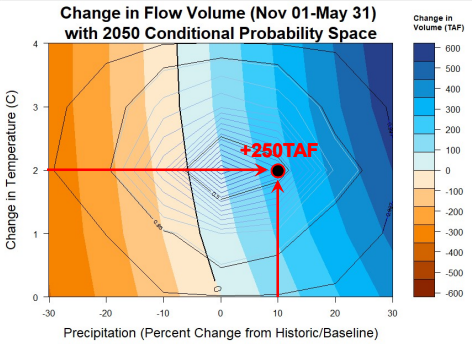

Water Supply

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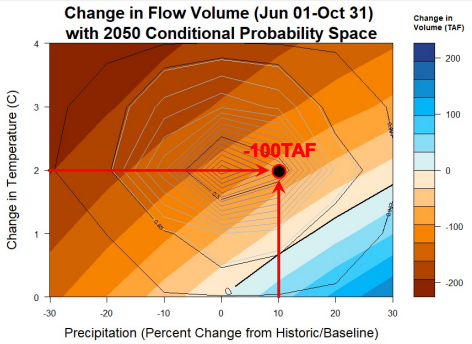

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Schedule

- Technical Analyses – Early 2019
- Technical Memos – Spring 2019
- Draft Report –Summer 2019

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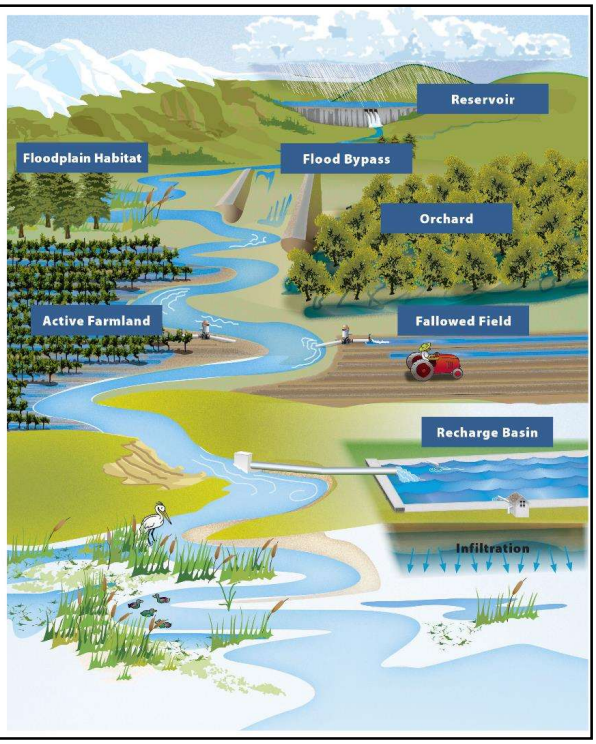
Contact:

David.Arrate@water.ca.gov



Discussion Question #1

- What do you need help with in planning and implementing Flood-MAR projects?
  (15 minutes)

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Discussion Question #2

- Where are good locations to evaluate Flood-MAR project for multiple benefits?
  (15 minutes)

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Flood-MAR Public Workshop

RESEARCH AND DATA DEVELOPMENT

Discussion Question Preview

- Are you aware of specific research and data gaps for implementing Flood-MAR projects?
- How can the Research Advisory Committee outcomes be most useful to you or your organization?

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Research & Data Development Framework

- Convene Flood-MAR **R**esearch **A**dvisory **C**ommittee
- Frame body of knowledge
- Inventory, develop, and coordinate technical expertise
- Improve availability of research and technical expertise for all stakeholders
- Frame long-term research and data development
- Provide guidance to stakeholders

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Research Themes & Data Needs

- Improve understanding and advance Flood-MAR
- Support sustainable water resources management
- Inform scalable strategies and relevant decision-making tools
- Develop tools and applications

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Research Themes:

1. Hydrology Observation and Prediction
2. Reservoir Operations
3. Infrastructure Conveyance and Hydraulics
4. Crop Suitability
5. Soil Suitability, Geology, and Aquifer Characterization
6. Land Use Management
7. Water Quality
8. Recharge and Extraction Methods
9. Environment (Aquatic and Terrestrial)
10. People and Water
11. Economic Analysis
12. Local, State, Federal Policies and Legal
13. Tool and Application Development

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Activities of the Research Advisory Committee include:

- Develop living library of knowledge
- Develop a research and data development plan
- Create network of interested Collaborators & Advisors
  - Academics
  - Professional Associations
  - Agencies
  - Practitioners
  - NGOs
  - Others
- Provide guidance to develop and support technical and scientific activities, plans, and programs
- Oversee and provide independent, transparent, credible, and competent recommendations to technical and policy-informing studies
- Lead and develop an integrated training and education program

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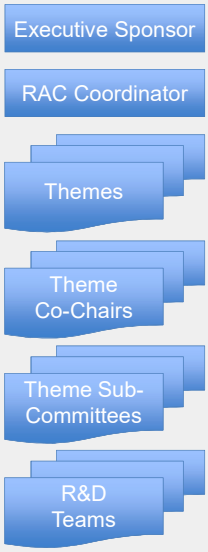
Research Advisory Committee Structure



- Guide RAC objectives and strategic direction
- Oversee and lead RAC activities
- Include the 13 Themes of Research
- Recommend Sub-Committee members
- Lead Sub-Committee activities
- Identify the best available research
- Provide guidance for future research needs
- Assist Sub-Committees
- Prepare, facilitate, and summarize meetings

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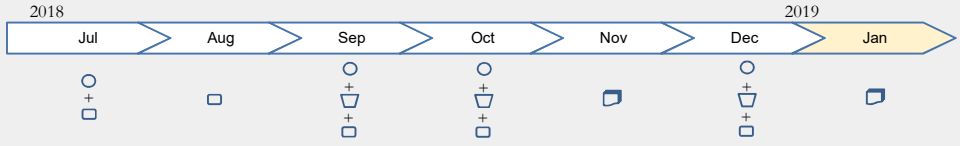
Flood-MAR Research Advisory Committee Members

Kris Tjernell (DWR) - Executive Sponsor

Romain Maendly (DWR) and Daniel Mountjoy (Sustainable Conservation) - RAC Co-Coordinators

Themes	Theme Co-Chairs	
	State	Non-State
1. Hydrology Observation and Prediction	Michael Anderson (DWR)	Lorraine Flint (USGS)
2. Reservoir Operation	Boone Lek (DWR)	Jay Lund (UC Davis)
3. Infrastructure Conveyance and Hydraulics	Yiguo Liang (DWR)	TBD
4. Crop Suitability	Ami Gunasekara (CDFA)	Doug Parker (UC ANR)
5. Soils, Geology and Aquifer Characterization	Tim Godwin (DWR)	Graham Fogg (UC Davis)
6. Land Use Management	Nuin-Tara Kev (OPR)	TBD
7. Water Quality	Scott Seyfried (SWRCB)	Thomas Harter (UC Davis))
8. Recharge and Extraction Methods	Mark Nordberg (DWR)	Jon Parker (Kern Water Bank Auth.)
9a. Environment - Terrestrial	Ron Melcer (DSC)	TBD
9b. Environment - Riparian/Aquatic	Marc Commandatore (DWR)	TBD
10. People and Water	Jose Alarcon (DWR)	TBD
11. Economic Analysis	Emmanuel Asinas (DWR)	Josué Medellin-Azuara (UC Merced)
12. Local, State, Federal Policies and other Legal	John Andrew (DWR)	TBD
13. Tool and Application Development	Rich Juricich (DWR)	Samuel Sandoval (UC Davis)

Proposed *Schedule for Flood-MAR Research Advisory Committee Work Activities*



	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Meeting Type	**State Co-Chair Meeting**	**Flood-MAR Public Workshop** - Direction of Program - Current and future activities	**Theme Specific Meeting** - Finalize Non-State Co-Chairs - Provide comments to R&D Framework - Identified/finalize Sub-Committee prospects	**RAC Meeting - Workshop** - Discussion on R&D Framework comments - Frame goals - Refine and set expectation and responsibility - Finalize Sub-Committee's members		**RAC Meeting** - First draft of the final R&D Framework - Literature review for each theme due - Provide template for R&D Plan	
Participants	. State Co-Chairs . R&D Team	. State Co-Chairs . Non-State Co-Chairs . Sub-Committees' prospects. . Public . R&D Team	. State Co-Chairs . Non-State Co-Chairs . R&D Team	. State Co-Chairs . Non-State Co-Chairs . R&D Team		. State Co-Chairs . Non-State Co-Chairs . R&D Team	

LEGEND

State Co-Chairs | Non-State Co-Chairs | Sub-Committees Meetings | R&D Team

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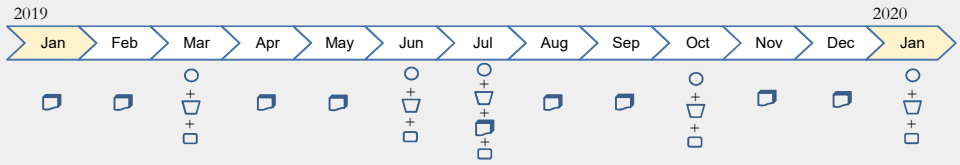
Proposed *Schedule for Flood-MAR Research Advisory Committee Work Activities*



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Meeting Type			**RAC Meeting** - Final R&D Framework - Initial Draft Flood-MAR R&D Plan			**RAC Meeting** - Draft Flood-MAR R&D Plan	**Flood-MAR Plenary Meeting**			**RAC Meeting**			**RAC Meeting** - Final Flood-MAR R&D Plan
Participants			. State Co-Chairs . Non-State Co-Chairs . R&D Team			. State Co-Chairs . Non-State Co-Chairs . R&D Team	. State Co-Chairs . Non-State Co-Chairs . Sub-Committees . Public . R&D Team			. State Co-Chairs . Non-State Co-Chairs . R&D Team			. State Co-Chairs . Non-State Co-Chairs . R&D Team

LEGEND

State Co-Chairs | Non-State Co-Chairs | Sub-Committees Meetings | R&D Team

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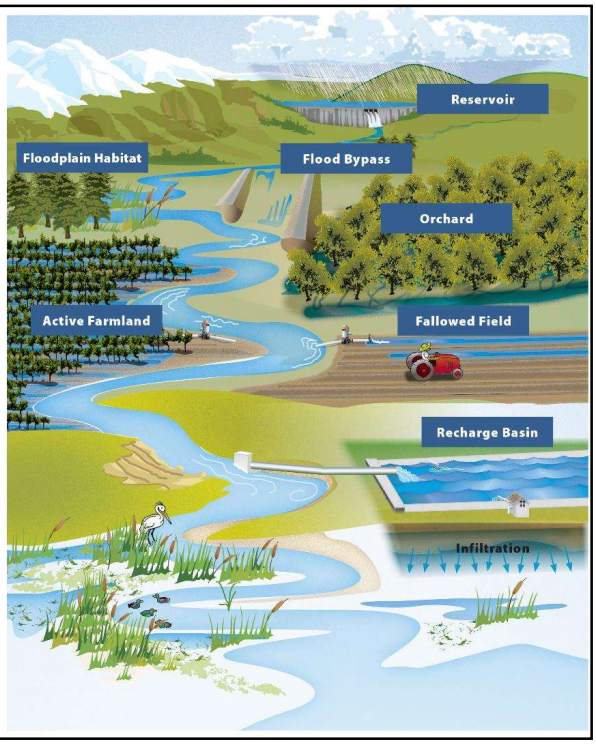
Contact:

Romain.Maendly
@water.ca.gov



Discussion Question #1

- Are you aware of specific research and data gaps for implementing Flood-MAR projects?
(15 minutes)

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Discussion Question #2

- How can the Research Advisory Committee outcomes be most useful to you or your organization? (15 minutes)

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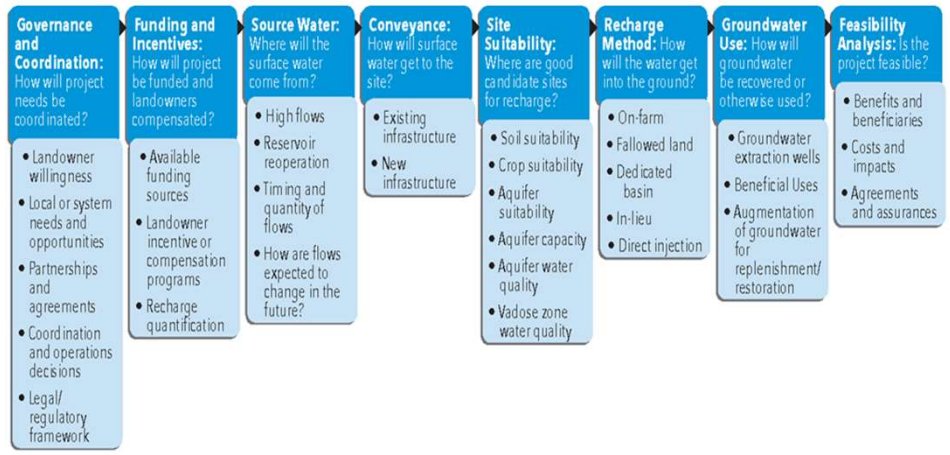
Flood-MAR Public Workshop

HOW TO STAY INVOLVED

Flood-MAR Implementation Factors



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Potential Barriers to Flood-MAR Implementation

- **Cooperation and Governance** – trust, sector coordination, operations agreements
- **Legal** – water rights, regulations, permitting
- **Policy –** public benefit, beneficial use, landowner compensation/incentives
- **Implementation –** land use, recharge/recovery suitability, conveyance, reservoir operations, economics, funding

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Discussion Question #1

- Considering the identified implementation factors, challenges, and barriers from the white paper, what priority topics would you like to engage on?
  (15 minutes)

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What Can I Do?

- **Landowners --** Look for project opportunities and expand partnerships
- **Academia and Private Researchers --** Continue to fill data gaps and conduct pilot projects
- **NGOs and Other Stakeholders --** Encourage broad public benefits and look for partnership opportunities
- **Gov't Agencies --** Provide technical and facilitation assistance (financial assistance, when available)
- **Regulators --** Streamline processes and provide compliance assistance
- **Policy- and Decision-Makers --** Authorize & fund agencies to remove barriers, conduct research, and support projects

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Venues for Coordination

- Join listserv
- Comment on program documents
- Join a RAC Subcommittee
- Follow DWR on social media
- Coordinate with DWR on future studies
- Work with DWR to develop projects and strategize to overcome obstacles
- Participate in future meetings

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Discussion Question #2

- How would you like to get Flood-MAR program updates? (5 minutes)

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Flood-MAR Public Workshop

NEXT STEPS

Next Steps

- Convene a Flood-MAR Research Advisory Committee (RAC) along with 13 sub-committees
- Develop a Research & Data Development Plan
- Continue investigation of concepts identified in the White Paper
- Evaluate Flood-MAR opportunities in other river basins, coastal, mountain, desert, etc.
- Provide planning and implementation guidance
- Support implementation of Flood-MAR

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Program Contact Information

Email: FloodMAR@water.ca.gov

Website: https://www.water.ca.gov/Programs/All-Programs/Flood-MAR

Flood MAR Listserv:
https://listservice.cnra.ca.gov/scripts/wa.exe?SUBED1=DWR_FLOODMAR&A=1

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